

RD-A121 861 A STUDY OF THE TOTAL COST OF CONVENTIONAL SHIP
PROPULSION FUEL(U) NAVAL SEA SYSTEMS COMMAND WASHINGTON
DC JUL 81

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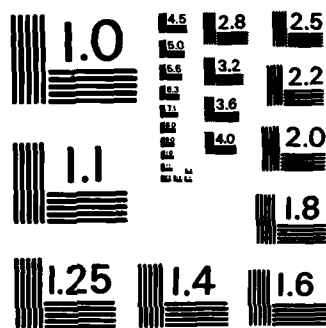
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Figure 1



MICROCOPY RESOLUTION TEST CHART
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tion capability. Due to the fact that the use of conventional fuel will be continued indefinitely into the future, consideration must be given to the replacement of fleet oilers and ocean escorts. All these factors contribute to the total cost of propulsion fuel used by conventionally powered U.S. Navy ships. The cost values and fuel delivery parameters used are based upon FY 80 data and therefore the basic fuel cost value is in FY 80 dollars. In addition to the derivation of a single fuel cost value, sensitivity analyses present the cost impacts due to variation in value of significant input values and/or assumptions.

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A Study of the Total Cost
of
Conventional Ship Propulsion Fuel

COST ESTIMATING AND ANALYSIS DIVISION
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, D.C.

JULY 1981

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1. Introduction/Background

The purpose of this study is to present the total cost of conventional fuel used by U.S. Navy ships for propulsion. This report is the result of a continuing effort by the NAVSEA Cost Estimating and Analysis Division to quantify the total cost of propulsion fuel used by Navy ships. The fuel costs, developed in past studies, have been used in the economic analysis of nuclear versus conventionally powered ships, in deriving the total cost of certain Naval operations and in design trade-offs of ship systems. This study provides updated information for use in these and similar studies. To the greatest extent possible the fuel costs presented are analytically consistent with past fuel studies in order to facilitate the updating of analyses which previously relied on these fuel costs.

Although analytical consistency has been stressed in the performance of this study, the search for better data sources has been equally important. This search included review of the Defense Energy Information System (DEIS), the Navy Facilities Assets Data Base (NFADB), 3-M Maintenance Data System (MDS), Visability and Management of Operating and Support Cost-Ships (VAMOSC-SHIPS) management information system and Ships Parts Control Center information on oiler bulk fuel transfers. Review of these sources and the incorporation of data from them, has enhanced the validity of the inputs used in this Fuel Study. Also, for the first time, the cost of fuel storage and handling facilities has been included. The inclusion of this cost has increased the scope of this fuel study as compared with previous studies.

3. Storage and Handling Cost

The cost of fuel storage and handling consists of the imputed annual acquisition cost of storage and handling facilities, plus the operation and maintenance cost of these facilities, plus the cost of modernizing these facilities including the cost of improvements made for compliance with government regulations. The imputed annual acquisition cost of fuel storage and handling facilities is calculated for Navy owned and operated Defense Fuel Supply Points (DFSP) within the United States. NAVSUP identified these fuel terminals as being representative of all Navy terminals.

Table 1. Navy Owned and Operated Defense Fuel Supply Points in the United States

Adak, Alaska
Key West, Florida
Puget Sound, Washington
Norfolk, Virginia
Jacksonville, Florida
Charleston, South Carolina
Oakland, California
San Diego, California
Pearl Harbor, Hawaii

The acquisition cost of these facilities is obtained from the Detailed Inventory of Naval Shore Facilities. The Detailed Inventory of Naval Shore Facilities is an annual publication of the Navy Facilities Engineering Command.

Basically, the total cost of conventional propulsion fuel used by U.S. Navy ships consists of three major cost elements. These three cost elements are:

1. Purchase Price
2. Storage and Handling Cost
3. Delivery Cost

The methodology and data used to derive costs for each of these elements are described in the following sections of this report. The basic analysis consists of generating dollar values for each element of fuel cost in FY 80 dollars, on a cost per barrel basis. Fiscal year 1980 is the base year for this analysis. The FY 80 values are also inflated to "Then Year" dollars, through FY 2000, in Section 5 Sensitivity Analysis. Sensitivities are also presented for several of the major input data elements of this study. These sensitivities are performed recognizing that some data do not have a single valid value and/or that their value is the result of subjective analytical judgement.

2. Purchase Price

Purchase price is the direct cost for the propulsion fuel used by Navy ships. The DOD establishes stabilized rates for the various fuel products it uses to simplify the accounting procedures relating to fuel cost accounting. Since these rates are based upon the actual costs paid for fuel, the stabilized rates are used in this study. The stabilized rate for distillate fuel is the specific rate used in this study since it is the primary source of conventional ship propulsion fuel.

In February of 1980 the stabilized rate of distillate fuel was raised from \$25.62 per barrel to \$54.18 per barrel due to the increased cost to DOD for distillate fuel acquisition. Therefore the nominal value for fuel purchase price used in this study is \$54.18 in FY 80 dollars.

This report is generated from the Navy Facilities Assets Data Base (NFADB) which is maintained by NAVFAC. The NFADB lists every facility at every Navy activity by a five digit function code. In order to determine depreciation costs NAVFAC has established the economic life in years for each facility code. The fifteen facility category codes which are of interest to this study are presented in Table 2 along with their description and economic life.

Table 2. Facility Category Codes

| Category Code | Description | Economic Life (years) |
|---------------|-----------------------------|-----------------------|
| 12210 | Marine Fueling Facility | 38 |
| 12220 | Small Craft Fueling Sta | 38 |
| 12420 | Drum/Can Ready Fuel Strg | 25 |
| 12440 | Sm Craft Ready Fuel Strg | 25 |
| 12510 | POL Pipeline | 25 |
| 12516 | Misc POL Pipeline Fac | 25 |
| 12520 | Shltr Misc Pipeline Fac | 31 |
| 12610 | Drum & Can Loading Facility | 25 |
| 12630 | Tank Truck/Car Load Fac | 25 |
| 12640 | Tank Truck/Car Unload Fac | 25 |
| 14375 | POL Opn/Sampling/Test Bldg | 44 |
| 15140 | Fueling Pier | 38 |
| 15240 | Fueling Wharf | 38 |
| 41110 | Ship Fuel Storage | 38 |
| 41130 | Diesel Fuel Storage | 38 |

For each facility code at each Navy activity the NFADB gives, among many other data elements, the initial acquisition cost of the facility and the acquisition cost inflated to current year dollars.

All of the facility codes listed in Table 2 do not relate exclusively to storage and handling of ships propulsion fuel. For example, Petroleum, Oil and Lubricants (POL) pipeline costs would be related to all POL products, not just Diesel Fuel Marine (DFM). To obtain facility cost values for these types of facilities, the total facilities cost was multiplied by the ratio of DFM to POL issues. The DFM facilities cost values were then divided by the economic life of that type facility to obtain an annual DFM facilities cost value. The total annual DFM facilities cost was divided by the total number of barrels of DFM issued from the nine Navy owned and operated DFSP's in the United States to derive a cost per barrel of DFM.

The DFM and POL issues for FY 80 were obtained from the Defense Energy Information System (DEIS) which is maintained by the Defense Fuel Supply Command. The DEIS produces various monthly reports on fuel transfers for all Defense activities. Each report gives fuel transfers for the month and the cumulative values for the fiscal year. DEIS reports for the month of September 1980 were used to obtain the total DFM issues from each of the nine Navy DFSPs and the total DFM and total POL issues for all DFSPs. These were the fuel issue values which were used to generate facilities cost on a per barrel of DFM basis. The results of this DFM facilities cost analysis are presented in Table 3.

Table 3. DFM Facilities Cost Analysis Summary

| | |
|-----------------------------------|------------|
| Total DFM Facilities Cost | \$408,226K |
| Total Annual DFM Facilities Cost | \$ 11,371K |
| Total Barrels of DFM Issued | 11,423K |
| Facilities Cost per Barrel of DFM | \$ 1.00 |

In addition to the imputed value for facilities costs, the storage and handling cost also includes the cost of operating, maintaining, and modernizing the storage and handling facilities. These costs for FY 80 were obtained from the Naval Supply Systems Command for each of the nine Navy DFSP's used in this study. The total costs were allocated to DFM facilities in accordance with procedures also provided by NAVSUP. These DFM related costs were put on a per barrel of DFM basis by dividing them by the total DFM issues which were obtained from the DEIS.

The total amount spent on operations and maintenance during FY 80 at Navy DFSP's, and the amount of DFM issued from them has remained essentially the same as they were for previous studies. Therefore, the O&M cost per barrel of fuel has remained essentially the same, showing only a very slight decrease. The amount that was spent during FY 80 on military construction, however, has decreased significantly when compared to previous studies. This is attributed to the facts that required construction for meeting pollution standards and for POL modernization have been completed. The cost per barrel of fuel for operations, maintenance and military construction at Navy DFSP's for FY 80 is \$0.47. Combining this figure with the imputed facilities cost yields \$1.47 per barrel of fuel for storage and handling during FY 80.

4. Delivery Cost

4.1. Overview

Fuel delivery cost consists of the imputed annualized acquisition cost and operating and support costs of oilers which deliver fuel to the fleet and the escort ships which provide protection to these oilers. Since oilers also deliver cargo other than ship propulsion fuel, the costs associated with these ships and their escorts must be prorated or allocated to the function of ship propulsion fuel delivery. Also, Navy ships do not receive all of their fuel from oilers; some fuel is received directly from fuel terminals. Receipt of fuel directly from a fuel terminal incurs no delivery cost. Therefore fuel delivery cost is normalized based upon the proportional amounts of fuel received at fuel terminals and that received from oilers during Underway Replenishment (UNREP). Finally, since the Navy will procure new oilers and escort ships, delivery costs are assessed on both a current and future fleet basis. Each of these aspects of fuel delivery cost are discussed in more detail in the following paragraphs. Also, Appendix C presents the delivery cost equations and calculations.

4.2. Ship Acquisition Cost

The ship acquisition cost includes the initial acquisition cost of the ship plus the cost of conversions and modernizations performed on the ship, expressed in FY 80 dollars. To put the acquisition cost on an annual basis, the total acquisition cost is divided by the economic life of the ship. As in past studies, the economic life of these ships is assumed to be thirty years. This value does not represent, nor should it be misconstrued to represent, the replacement value of the ship. The value used is essentially the annual depreciation of the ship expressed in FY 80 dollars. A summary of the annualized ship acquisition costs is presented in Table 4. Appendix A contains the detailed acquisition cost data.

Table 4. Ship Acquisition Cost Summary

(Millions of FY 80 Dollars)

| | <u>Total Acquisition Cost</u> | <u>Imputed Annual Cost</u> |
|--------|---------------------------------------|------------------------------------|
| AO | 100.65 | 3.355 |
| TAO | 75.66 | 2.522 |
| Escort | 67.37 | 2.244 |

4.3. Ship Operating and Support Cost

The Operating and Support (O&S) Cost for Navy oilers and escort ships were derived from the VAMOSC-SHIPS reporting system. The O&S cost for each ship for fiscal years 77, 78 and 79 were inflated to FY 80 dollars and averaged to obtain the O&S values used in this study. Oilers operated by the Military Sealift Command (MSC) are not included in the O&S costs reported by the VAMOSC-SHIPS system. Therefore, the average TAO O&S cost was estimated by assuming that the ratio of the TAO crew cost to AO crew cost is equal to the ratio of their O&S costs. The costs for Navy and MSC oiler crews are obtained from an OPNAV study on Fleet Support ships. This is the same technique which has been used in previous fuel studies. Table 5 presents a summary of O&S costs, Appendix B gives detailed O&S data for Navy Ships.

Table 5. Operating and Support Cost Summary
(Millions of FY 80 Dollars)

| | |
|--------|--------|
| A0 | 14.637 |
| TA0 | 20.586 |
| Escort | 18.727 |

4.4. Delivery Cost Allocations

The allocation of oiler costs to ship propulsion fuel delivery is based upon the percent of the oilers total POL deliveries which are DFM. The DFM percentage for A0's and TA0's was based upon data covering an eighteen month period. To obtain a per barrel delivery cost, the A0 and TA0 DFM delivery costs are simply divided by the average number of barrels each delivers annually. Table 6 presents the DFM percentage and the average DFM deliveries for A0s and TA0s.

Table 6. Oiler DFM Delivery Values

| | <u>DFM Per Cent</u> | <u>DFM Deliveries (K bbls)</u> |
|-----|-------------------------|------------------------------------|
| A0 | 78 | 275.3 |
| TA0 | 72 | 767.7 |

The cost of escort ships is allocated to ship propulsion fuel delivery by developing an escort ship cost per oiler. Past task force studies have shown that escorts and replenishment ships are assigned to the task force in a ratio of approximately six to four. Based upon this fact alone the number of escorts per oiler would be 1.5. However, escort ships are not solely dedicated to oiler support nor are the oilers constantly in the company of the escort ships. Therefore, it was assumed, as in past studies, that the escort ships accompany the oilers half of the time. The resulting number of escorts per oiler is, then, .75.

4.5. Current Delivery Cost

The cost of delivering fuel to ships at sea is derived using a weighted average technique. The average annual acquisition cost and average O&S cost for AOs, TAOs and escort ships have been presented in Tables 4 and 5 respectively. The average annual AO acquisition cost is added to the average annual AO O&S cost and the sum is multiplied by the DFM percentage for AOs. This value is multiplied by the number of AOs to yield the total delivery cost for AOs. This same procedure is used to calculate the TAO total delivery cost using TAO values. For escort ships the sum of the average annual acquisition cost and average annual O&S cost is multiplied by a composite DFM percentage and the number of escorts per oiler. This yields escort costs on a per oiler basis. Therefore, this value is multiplied by the total number of AOs and TAOs, resulting in the total delivery cost for escort ships. Adding the delivery costs for AOs, TAOs and escort ships, yields the total cost of delivering DFM by escorted UNREP oiler.

To calculate a total fuel delivery cost on a per barrel basis, the total barrels delivered is required. This value was derived by adding the total barrels of fuel delivered by Navy and MSC oilers. The total amount of fuel delivered by an AO was calculated by multiplying the average amount of fuel delivered by an AO times the number of AOs. The amount of fuel delivered by a TAO was calculated in the same manner. Adding the total barrels of fuel delivered by AO and TAO yields the total barrels of DFM delivered by UNREP oiler. Dividing the total delivery cost by total fuel delivered, yields the delivery cost per barrel of fuel delivered by escorted UNREP oiler of \$36.02.

When ships receive fuel directly from fuel terminals, no delivery costs are incurred. This fact must be accounted for to develop a normalized fuel delivery cost. Based upon previous studies, it is assumed that ships received 70% of their fuel from an UNREP oiler and 30% from a fuel terminal. This 70/30 split is intended to be a representative value for all Navy ships. Some ships may receive all their fuel from oilers while other ships may receive all their fuel from a terminal. Therefore, using the total fuel cost value presented in this report for a particular ship type, should be done with caution. The normalized current fuel delivery cost is weighted 70% UNREP and 30% In-Port. Since the In-Port delivery cost is zero, the normalized current fuel delivery cost is simply 70% of the UNREP delivery cost. The resulting normalized current fuel delivery cost is, then, \$25.21 per barrel.

4.6. Current Fuel Cost Summary

Thus far, the cost of purchasing, storing, handling, and delivering fuel has been presented. Table 7 summarizes these costs and presents the total cost of ship propulsion fuel.

Table 7. Current Fuel Cost Summary

| | |
|----------------------|--------------|
| Purchase | \$54.18/bbl |
| Storage and handling | 1.47 |
| Delivery | <u>25.21</u> |
| | \$80.86/bbl |

4.7. Future Delivery Cost

Since current oilers and escort ships will have to be replaced, it is appropriate to consider the impact these replacements may have on fuel delivery costs. The AO 177 and the FFG 7 respectively represent the future oiler and escort ship. The essential elements in calculating delivery cost are the annual acquisition cost, annual O&S cost, DFM percentage of total POL and the annual DFM delivery amount. The fact that the future ships do not have procurement and O&S histories comparable with the current delivery ships, necessitates the use of representative data as opposed to historical averages. The average acquisition costs for these two future ships are based upon previous fuel study work and other sources of ship costs. The costs are put on an annual basis by assuming a 30 year economic life. The annual O&S costs were derived from the November 1980 Navy Program Factors Manual. The DFM percentage of total POL deliveries and the DFM delivery quantities are taken from previous fuel study analysis. Table 8 summarizes the data values for these future fuel delivery ships.

Table 8. Future Ships Fuel Delivery Cost Parameters

| | <u>Annual Acquisition, Cost</u> | <u>Annual O&S Cost</u> | <u>DFM % of POL</u> | <u>Annual DFM Deliveries</u> |
|--------|---|------------------------------------|-----------------------------|--------------------------------------|
| AO 177 | \$5.8M | \$14.5M | 60% | 288K bbls |
| FFG 7 | \$7.5M | \$ 8.3M | - | - |

Based upon the values in Table 8, the future cost of delivering DFM to ships at sea by escorted UNREP oiler is \$66.98 per barrel as compared to the current cost of \$36.02/bbl. Multiplying by 70% to obtain the future normalized fuel delivery cost yields \$46.89/bbl as compared to the current cost of \$25.21/bbl. This takes into consideration the fact that 30% of ship propulsion fuel is received from fuel terminals and incurs no delivery cost.

4.8. Overall Fuel Cost Summary

The overall fuel cost in FY 80 dollars on a cost per barrel basis consists of the purchase price, storage and handling costs and the average of the current and future normalized delivery costs. Taking a straight average of the current and future normalized delivery costs of \$25.21/bbl and \$46.89/bbl respectively, implies a 50/50 mix of current and future fleet oilers and their associated ocean escorts. This 50/50 mix is the technique which was used in past fuel studies and is used in this study to maintain analytical consistency. Table 9 presents this overall fuel cost summary.

Table 9. Overall Fuel Cost Summary

| | |
|----------------------|-----------------|
| Purchase | \$ 54.18/bbl |
| Storage and handling | 1.47 |
| Delivery | \$ <u>36.05</u> |
| Total | \$ 91.70 |

5. Sensitivity Analyses

This section presents the sensitivity of the total fuel cost to variations in value of major data elements.

5.1. Escalated Total Fuel Costs

The derivation of total fuel cost in the body of this report is performed exclusively in FY 80 dollars. To show the impact of inflation on these costs they have been escalated to then year dollars using the Feb 1981 indices from the Assistant Secretary of Defense. The following table presents these costs for 1980, the base year, through the year 2000.

Table 10. Escalated Total Fuel Cost

| <u>Year</u> | <u>Cost</u> | <u>Year</u> | <u>Cost</u> |
|-------------|-------------|-------------|-------------|
| 1980 | \$ 91.70 | 1990 | \$181.94 |
| 1981 | 109.09 | 1991 | 191.04 |
| 1982 | 118.58 | 1992 | 200.59 |
| 1983 | 127.24 | 1993 | 210.62 |
| 1984 | 135.13 | 1994 | 221.15 |
| 1985 | 142.56 | 1995 | 232.21 |
| 1986 | 149.69 | 1996 | 243.82 |
| 1987 | 157.17 | 1997 | 256.01 |
| 1988 | 165.03 | 1998 | 268.81 |
| 1989 | 173.28 | 1999 | 282.25 |
| | | 2000 | 296.36 |

5.2. Fuel Delivery Quantity

The amount of fuel delivered by Navy and MSC oilers varies from year to year. The following table shows the sensitivity of total fuel cost to changes in fuel delivery quantities. In the calculation of these values the purchase price and storage and handling costs were held constant at their base values. Also, the current and future delivery costs were held constant allowing the cost per barrel of fuel to vary strictly as a function of delivery quantity.

Table 11. Fuel Delivery Quantity Sensitivity

| <u>% Change From Base</u> | <u>Average Annual Delivery Quantity Per Oiler</u> | <u>Delivery Cost</u> | <u>Total Fuel Cost</u> |
|-----------------------------------|---|--------------------------|--------------------------------|
| - 20 | 361 K bbls | \$ 45.12/bbl | \$100.77/bbl |
| - 10 | 406 | 40.08 | 95.73 |
| 0 | 451 | 36.05 | 91.70 |
| + 10 | 496 | 32.76 | 88.41 |

5.3. UNREP Delivery Percentage

The amount of fuel which is received by Navy ships from fleet oilers expressed as a percent of total fuel received by the ship, is a difficult value to obtain. This is due to the structure of the fuel reporting systems which summarize total fuel for the oiler or the ship. Also, the value is subject to changes in fleet operating policies which are in turn subject to changes in world events. The 70/30 UNREP/In-Port delivery split may also vary by ship type. Therefore, total fuel cost has been sensitized to changes in the percent of fuel delivered by UNREP oiler in the following table.

Table 12. UNREP Delivery Percentage Sensitivity

| <u>UNREP %</u> | <u>Delivery Cost</u> | <u>Total Fuel Cost</u> |
|--------------------|--------------------------|----------------------------|
| 50 | \$25.75/bbl | \$ 81.40/bbl |
| 60 | 30.90 | 86.55 |
| 70 (base) | 36.05 | 91.70 |
| 80 | 41.20 | 96.85 |
| 90 | 46.35 | 102.00 |

5.4. Escorts per Oiler

In the basic determination of fuel cost it was assumed that there were .75 escort ships per oiler. Due to the subjectivity of this value, delivery cost and total fuel cost have been sensitized to the number of escorts per oiler in the following table.

Table 13. Escorts per Oiler Sensitivity

| <u>Escorts Per Oiler</u> | <u>Total Delivery Cost</u> | <u>Total Fuel Cost</u> |
|----------------------------------|------------------------------------|--------------------------------|
| .5 | \$31.98/bbl | \$87.63/bbl |
| .6 | 33.61 | 89.26 |
| .7 | 35.24 | 90.89 |
| .75 (base) | 36.05 | 91.70 |
| .8 | 36.87 | 92.52 |
| .9 | 38.50 | 94.15 |
| 1.0 | 40.13 | 95.78 |

5.5. Current/Future Ship Mix

In calculating the total overall cost of fuel, a 50/50 mix of current and future ships was used. The actual ratio of current to future ships would change incrementally as new ships are added to and old ships are removed from the fleet. The impact of various other ratios on the total overall delivery cost and total overall fuel cost are shown in the sensitivity analysis of this data element.

Table 14. Current/Future Ship Mix Sensitivity

| <u>Percent Current Ships</u> | <u>Percent Future Ships</u> | <u>Total Delivery Cost</u> | <u>Total Fuel Cost</u> |
|--------------------------------------|-------------------------------------|------------------------------------|--------------------------------|
| 100 | 0 | \$25.21/bbl | \$ 80.86/bbl |
| 75 | 25 | 30.63 | 86.28 |
| 50 | 50 | 36.05 | 91.70 |
| 25 | 75 | 41.47 | 97.12 |
| 0 | 100 | 46.89 | 102.54 |

Appendix A

Ship Acquisition Cost Data

*** SHIPS ACQUISITION COST ***
(THOUSANDS OF DOLLARS)

| UTC | NAME | TYPE | CLASS | HULL | TOTAL FY81s | COST FY80s | IMPUTED ANNUAL |
|-------|-------------|------|-------|------|----------------|---------------|-------------------|
| ----- | ----- | ---- | ---- | ---- | ----- | ----- | ----- |
| | | AO | **** | **** | 109583 | 100649 | 3354 |
| | | AO | 22 | **** | 130957 | 120281 | 4009 |
| 04951 | ASHTABULA | AO | 22 | 51 | 130957 | 120281 | 4009 |
| | | AO | 51 | **** | 119727 | 109967 | 3665 |
| 04848 | CALDOUSAHAT | AO | 51 | 98 | 119678 | 109922 | 3664 |
| 04849 | CANTSTED | AO | 51 | 99 | 119777 | 110012 | 3667 |
| | | AO | 143 | **** | 88752 | 81517 | 2717 |
| 05907 | TRUCKEE | AO | 143 | 147 | 88752 | 81517 | 2717 |
| 05908 | PONCHATOU | AO | 143 | 148 | 88752 | 81517 | 2717 |
| | | AOE | **** | **** | 224300 | 206015 | 6867 |
| | | AOE | 1 | **** | 224300 | 206015 | 6867 |
| 05832 | SACRAMENTO | AOE | 1 | 1 | 218853 | 201012 | 6700 |
| 05833 | CAMDEN | AOE | 1 | 2 | 193460 | 177689 | 5923 |
| 05848 | SEATTLE | AOE | 1 | 3 | 245001 | 225029 | 7501 |
| 20120 | DETROIT | AOE | 1 | 4 | 239889 | 220333 | 7344 |
| | | AOR | **** | **** | 113606 | 104345 | 3478 |
| | | AOR | 1 | **** | 113606 | 104345 | 3478 |
| 05849 | WICHITA | AOR | 1 | 1 | 124584 | 114428 | 3814 |
| 05850 | MTLWAUKEE | AOR | 1 | 2 | 113165 | 103940 | 3465 |
| 20122 | KANSAS CIT | AOR | 1 | 3 | 100521 | 92327 | 3078 |
| 20123 | SAVANNAH | AOR | 1 | 4 | 94321 | 86632 | 2888 |
| 20124 | WABASH | AOR | 1 | 5 | 102672 | 94302 | 3143 |
| 20125 | KALAMAZOO | AOR | 1 | 6 | 104419 | 95906 | 3197 |
| 20248 | ROANOKE | AOR | 1 | 7 | 155562 | 142881 | 4763 |
| | | FF | **** | **** | 71382 | 65563 | 2185 |
| | | FF | 1037 | **** | 54028 | 49623 | 1654 |
| 54035 | BRONSTEIN | FF | 1037 | 1037 | 58669 | 53886 | 1796 |

*** SHIPS ACQUISITION COST ***
(THOUSANDS OF DOLLARS)

| UIC | NAME | TYPE | CLASS | HULL | TOTAL FY81\$ | COST FY80\$ | IMPUTED ANNUAL |
|-------|-------------|------|-------|------|-----------------|----------------|-------------------|
| ----- | ----- | ---- | ---- | ---- | ----- | ----- | ----- |
| 54036 | MC CLOY | FF | 1037 | 1038 | 49387 | 45361 | 1512 |
| | | FF | 1040 | **** | 72443 | 66538 | 2218 |
| 54037 | GARCIA | FF | 1040 | 1040 | 81151 | 74535 | 2485 |
| 54038 | BRADLEY | FF | 1040 | 1041 | 67140 | 61666 | 2056 |
| 54039 | MC DONNELLY | FF | 1040 | 1043 | 68272 | 62706 | 2090 |
| 54040 | BRUMBY | FF | 1040 | 1044 | 58978 | 54170 | 1806 |
| 54041 | DAVIDSON | FF | 1040 | 1045 | 63757 | 58560 | 1952 |
| 54042 | VOGE | FF | 1040 | 1047 | 139825 | 128426 | 4281 |
| 54043 | SAMPLE | FF | 1040 | 1048 | 61575 | 56555 | 1885 |
| 54044 | KOELSCH | FF | 1040 | 1049 | 68215 | 62654 | 2088 |
| 54045 | DAVID, ALB | FF | 1040 | 1050 | 60387 | 55465 | 1849 |
| 54046 | O CALLAHAN | FF | 1040 | 1051 | 55138 | 50643 | 1688 |
| | | FF | 1052 | **** | 71906 | 66044 | 2201 |
| 54047 | KNOX | FF | 1052 | 1052 | 174803 | 160553 | 5352 |
| 54048 | ROAPK | FF | 1052 | 1053 | 77953 | 71598 | 2387 |
| 54049 | GRAY | FF | 1052 | 1054 | 75648 | 69481 | 2316 |
| 54050 | HEPRURN | FF | 1052 | 1055 | 78718 | 72301 | 2410 |
| 54051 | CONNOLE | FF | 1052 | 1056 | 70125 | 64409 | 2147 |
| 54052 | RATHBURN | FF | 1052 | 1057 | 67891 | 62356 | 2079 |
| 54053 | MEYERKORD | FF | 1052 | 1058 | 74086 | 68046 | 2268 |
| 54054 | STMS, W S | FF | 1052 | 1059 | 68096 | 62545 | 2085 |
| 54055 | LANG | FF | 1052 | 1060 | 73151 | 67188 | 2240 |
| 54056 | PATTERSON | FF | 1052 | 1061 | 69297 | 63648 | 2122 |
| 54057 | WHIPPLE | FF | 1052 | 1062 | 110692 | 101668 | 3389 |
| 54058 | REASOMER | FF | 1052 | 1063 | 67400 | 61906 | 2064 |
| 54059 | LOCKWOOD | FF | 1052 | 1064 | 78142 | 71772 | 2392 |
| 54060 | STETN | FF | 1052 | 1065 | 70606 | 64850 | 2162 |
| 54061 | SHEILDS, M | FF | 1052 | 1066 | 79790 | 73285 | 2443 |
| 54062 | HAMMOND, F | FF | 1052 | 1067 | 71375 | 65557 | 2185 |
| 54063 | VREFLAND | FF | 1052 | 1068 | 70317 | 64585 | 2153 |
| 54064 | BAGLEY | FF | 1052 | 1069 | 67631 | 62117 | 2071 |
| 54065 | DOWNES | FF | 1052 | 1070 | 76884 | 70616 | 2354 |
| 54066 | BADGER | FF | 1052 | 1071 | 73991 | 67959 | 2265 |
| 54067 | BLAKELY | FF | 1052 | 1072 | 66323 | 60916 | 2031 |
| 54068 | PFARY, ROH | FF | 1052 | 1073 | 77042 | 70761 | 2359 |
| 54069 | HOLT, HARO | FF | 1052 | 1074 | 76958 | 70684 | 2356 |
| 54070 | TRIPPE | FF | 1052 | 1075 | 64916 | 59624 | 1987 |
| 54071 | FANNING | FF | 1052 | 1076 | 74023 | 67988 | 2266 |
| 54072 | OVELLETT | FF | 1052 | 1077 | 68241 | 62678 | 2089 |
| 20049 | HEWES, JOS | FF | 1052 | 1078 | 74859 | 68757 | 2292 |
| 20050 | BOWEN | FF | 1052 | 1079 | 62193 | 57123 | 1904 |
| 20051 | PAUL | FF | 1052 | 1080 | 62005 | 56950 | 1898 |
| 20052 | AYLWIN | FF | 1052 | 1081 | 62345 | 57263 | 1909 |

*** SHIPS ACQUISITION COST ***
(THOUSANDS OF DOLLARS)

| UTC | NAME | TYPE | CLASS | HULL | TOTAL FY81\$ | COST FY80\$ | IMPUTED ANNUAL |
|-------|------------|------|-------|--------|-----------------|----------------|-------------------|
| ----- | ----- | ---- | ---- | ---- | ----- | ----- | ----- |
| 20053 | MONTGOMERY | FF | 1052 | 1082 | 62088 | 57027 | 1901 |
| 20054 | COOK | FF | 1052 | 1083 | 64615 | 59348 | 1978 |
| 20055 | MC CANDLES | FF | 1052 | 1084 | 65628 | 60278 | 2009 |
| 20056 | BEARY, DON | FF | 1052 | 1085 | 63282 | 58123 | 1937 |
| 20057 | BREWTON | FF | 1052 | 1086 | 63616 | 58430 | 1948 |
| 20058 | KIRK | FF | 1052 | 1087 | 69324 | 63673 | 2122 |
| 20066 | BARREY | FF | 1052 | 1088 | 65892 | 60521 | 2017 |
| 20067 | BROWN, JES | FF | 1052 | 1089 | 65892 | 60521 | 2017 |
| 20068 | ATNSWORTH | FF | 1052 | 1090 | 65892 | 60521 | 2017 |
| 20069 | MYLIER | FF | 1052 | 1091 | 62733 | 57619 | 1921 |
| 20070 | HART, THOM | FF | 1052 | 1092 | 62733 | 57619 | 1921 |
| 20071 | CAPODANNO | FF | 1052 | 1093 | 62733 | 57619 | 1921 |
| 20072 | PHARRIS | FF | 1052 | 1094 | 62733 | 57619 | 1921 |
| 20073 | TRUETT | FF | 1052 | 1095 | 62733 | 57619 | 1921 |
| 20074 | VALDEZ | FF | 1052 | 1096 | 62733 | 57619 | 1921 |
| 20075 | MOINSTER | FF | 1052 | 1097 | 59570 | 54714 | 1824 |
| | | FFG | **** | **** | 91682 | 84208 | 2807 |
| | | FFG | | 1 **** | 91682 | 84208 | 2807 |
| 04692 | BROOKF | FFG | 1 | 1 | 113543 | 104287 | 3476 |
| 04693 | RAMSEY | FFG | 1 | 2 | 97999 | 90010 | 3000 |
| 04694 | SCHOFTELD | FFG | 1 | 3 | 92655 | 85102 | 2837 |
| 04695 | TALBOT | FFG | 1 | 4 | 92728 | 85169 | 2839 |
| 04698 | PAGE, RICH | FFG | 1 | 5 | 77268 | 70970 | 2366 |
| 04699 | FURER, JUL | FFG | 1 | 6 | 75899 | 69712 | 2324 |
| | | TAO | **** | **** | 82376 | 75661 | 2522 |
| | | TAO | 22 | **** | 38887 | 35716 | 1190 |
| 04957 | MARTAS | TAO | 22 | 57 | 39290 | 36087 | 1203 |
| 04962 | TALLUGA | TAO | 22 | 62 | 38484 | 35346 | 1178 |
| | | TAO | 105 | **** | 87889 | 80724 | 2690 |
| 04805 | MYSPILLTON | TAO | 105 | 105 | 106595 | 97905 | 3263 |
| 04806 | NAVASOTA | TAO | 105 | 106 | 76069 | 69867 | 2329 |
| 04807 | PASSUMPSIC | TAO | 105 | 107 | 91709 | 84233 | 2808 |
| 04808 | PAWCATUCK | TAO | 105 | 108 | 86466 | 79417 | 2647 |
| 04809 | WACCAMAW | TAO | 105 | 109 | 78607 | 72199 | 2407 |
| | | TAO | 143 | **** | 97231 | 89305 | 2976 |
| 05903 | NEUSHO | TAO | 143 | 143 | 118303 | 108659 | 3622 |
| 05904 | MISSISSINE | TAO | 143 | 144 | 93119 | 85528 | 2851 |

*** SHIPS ACQUISITION COST ***
(THOUSANDS OF DOLLARS)

| UTC | NAME | TYPE | CLASS | HULL | TOTAL FY81\$ | COST FY80\$ | IMPUTED ANNUAL |
|-------|------------|------|-------|------|-----------------|----------------|-------------------|
| ----- | ----- | ---- | ---- | ---- | ----- | ----- | ----- |
| 05905 | HASSAYAMPA | TAO | 143 | 145 | 88752 | 81517 | 2717 |
| 05906 | KAWTSHIWI | TAO | 143 | 146 | 88752 | 81517 | 2717 |

Appendix B

Ship Operating and Support Cost Data

*** VANOS-SEIPS OES DATA ***
 SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP OES COSTS
 FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | HULL | SHIP- YEARS | # | OFF | ENL | 1. DIRECT COSTS | 2. INTER MAINT | 3. DEPOT MAINT | 4. REC INVEST | 5. INDTR COSTS | TOTAL OES |
|------|-------|------|----------------|-----|-----|-----|--------------------|-------------------|-------------------|------------------|-------------------|--------------|
| ---- | ---- | ---- | ---- | --- | --- | --- | ----- | ----- | ----- | ----- | ----- | ----- |
| AN | *** | *** | 15 | 18 | 301 | | 5530 | 193 | 8627 | 83 | 200 | 14637 |
| AN | 22 | *** | 3 | 18 | 327 | | 5371 | 213 | 8877 | 139 | 193 | 14797 |
| AN | 22 | 51 | 3 | 18 | 327 | | 5371 | 213 | 8877 | 139 | 193 | 14797 |
| AN | 22 | 51 | FY77 | 19 | 324 | | 5813 | 65 | 23372 | 7 | 269 | 29528 |
| AN | 22 | 51 | FY78 | 18 | 328 | | 4880 | 227 | 1242 | 381 | 166 | 6898 |
| AN | 22 | 51 | FY79 | 19 | 331 | | 5421 | 349 | 2018 | 29 | 145 | 7965 |
| AN | 51 | *** | 6 | 20 | 307 | | 5784 | 153 | 3713 | 66 | 253 | 9973 |
| AN | 51 | 98 | 3 | 20 | 308 | | 5840 | 95 | 5080 | 51 | 202 | 11272 |
| AN | 51 | 98 | FY77 | 20 | 292 | | 6356 | 141 | 1394 | 83 | 285 | 8261 |
| AN | 51 | 98 | FY78 | 19 | 313 | | 6674 | 89 | 300 | 67 | 168 | 7300 |
| AN | 51 | 98 | FY79 | 21 | 321 | | 4492 | 57 | 13547 | 5 | 154 | 18257 |
| AN | 51 | 99 | 3 | 21 | 305 | | 5727 | 212 | 2345 | 81 | 305 | 8673 |
| AN | 51 | 99 | FY77 | 20 | 311 | | 6003 | 164 | 816 | 82 | 255 | 7321 |
| AN | 51 | 99 | FY78 | 22 | 296 | | 5818 | 293 | 217 | 135 | 128 | 6593 |
| AN | 51 | 99 | FY79 | 21 | 310 | | 5382 | 179 | 6004 | 26 | 533 | 12106 |
| AN | 143 | *** | 6 | 16 | 283 | | 5355 | 222 | 13416 | 72 | 151 | 19221 |
| AN | 143 | 147 | 3 | 16 | 272 | | 5305 | 296 | 213 | 26 | 156 | 6090 |
| AN | 143 | 147 | FY77 | 15 | 273 | | 5805 | 152 | 176 | 29 | 223 | 6477 |
| AN | 143 | 147 | FY78 | 17 | 271 | | 5132 | 499 | 201 | 15 | 174 | 5973 |
| AN | 143 | 147 | FY79 | 17 | 272 | | 5158 | 239 | 264 | 36 | 123 | 5821 |
| AN | 143 | 148 | 3 | 15 | 295 | | 5316 | 148 | 26619 | 118 | 146 | 32351 |
| AN | 143 | 148 | FY77 | 16 | 290 | | 5762 | 158 | 61834 | 7 | 241 | 68004 |
| AN | 143 | 148 | FY78 | 16 | 295 | | 4957 | 131 | 16821 | 324 | 114 | 22350 |
| AN | 143 | 148 | FY79 | 15 | 302 | | 5231 | 157 | 1202 | 25 | 84 | 6701 |
| ANE | *** | *** | 12 | 23 | 521 | | 9350 | 155 | 5876 | 92 | 575 | 16051 |
| ANE | 1 | *** | 12 | 23 | 521 | | 9350 | 155 | 5876 | 92 | 575 | 16051 |
| ANE | 1 | 1 | 3 | 25 | 549 | | 9422 | 39 | 12897 | 85 | 289 | 22736 |
| ANE | 1 | 1 | FY77 | 25 | 542 | | 9466 | 32 | 36378 | 7 | 455 | 46339 |
| ANE | 1 | 1 | FY78 | 26 | 560 | | 10079 | 40 | 1027 | 144 | 226 | 11518 |
| ANE | 1 | 1 | FY79 | 26 | 547 | | 8723 | 47 | 1288 | 105 | 186 | 10351 |

*** VAMOSC-SHIPS O&S DATA ***
SHIP TYPE, CLASS AND HULL AVFRAGES PLUS INDIVIDUAL SHIP O&S COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | HULL | SHIP- YEARS | OFF | ENL | 1. DIRECT COSTS | 2. INTER MAINT | 3. DEFECT MAINT | 4. REC INVEST | 5. INDTR COSTS | TOTAL O&S |
|------|-------|------|----------------|-----|-----|--------------------|-------------------|--------------------|------------------|-------------------|--------------|
| ANE | 1 | 2 | 3 | 23 | 524 | 9323 | 42 | 836 | 142 | 442 | 10787 |
| ANE | 1 | 2 | FY77 | 22 | 523 | 8456 | 3 | 0 | 0 | 407 | 8867 |
| ANE | 1 | 2 | FY78 | 24 | 531 | 8775 | 87 | 2079 | 245 | 195 | 11382 |
| ANE | 1 | 2 | FY79 | 23 | 518 | 10738 | 36 | 431 | 183 | 725 | 12114 |
| ANE | 1 | 3 | 3 | 23 | 508 | 9794 | 373 | 3004 | 93 | 777 | 14042 |
| ANE | 1 | 3 | FY77 | 23 | 515 | 10285 | 411 | 2380 | 125 | 442 | 13645 |
| ANE | 1 | 3 | FY78 | 23 | 507 | 9136 | 542 | 576 | 140 | 225 | 10620 |
| ANE | 1 | 3 | FY79 | 24 | 502 | 9961 | 166 | 6056 | 14 | 1664 | 17863 |
| ANE | 1 | 4 | 3 | 22 | 504 | 8861 | 165 | 6766 | 50 | 795 | 16640 |
| ANE | 1 | 4 | FY77 | 21 | 511 | 7658 | 21 | 19267 | 19 | 430 | 27397 |
| ANE | 1 | 4 | FY78 | 24 | 503 | 10258 | 367 | 453 | 16 | 190 | 11286 |
| ANE | 1 | 4 | FY79 | 23 | 499 | 8667 | 109 | 580 | 117 | 1765 | 11239 |
| ANR | *** | *** | 20 | 19 | 388 | 6854 | 125 | 2912 | 232 | 246 | 10373 |
| ANR | 1 | *** | 20 | 19 | 388 | 6854 | 125 | 2912 | 232 | 246 | 10373 |
| ANR | 1 | 1 | 3 | 18 | 402 | 6587 | 129 | 6438 | 406 | 219 | 13782 |
| ANR | 1 | 1 | FY77 | 18 | 396 | 7956 | 92 | 228 | 10 | 299 | 8586 |
| ANR | 1 | 1 | FY78 | 19 | 402 | 6383 | 101 | 558 | 46 | 171 | 7262 |
| ANR | 1 | 1 | FY79 | 19 | 408 | 5424 | 194 | 18528 | 1162 | 188 | 25498 |
| ANR | 1 | 2 | 3 | 18 | 377 | 7518 | 163 | 202 | 158 | 265 | 8310 |
| ANR | 1 | 2 | FY77 | 19 | 371 | 7934 | 111 | 14 | 230 | 292 | 8582 |
| ANR | 1 | 2 | FY78 | 20 | 375 | 6807 | 207 | 186 | 137 | 193 | 7532 |
| ANR | 1 | 2 | FY79 | 17 | 386 | 7815 | 171 | 408 | 109 | 312 | 8816 |
| ANR | 1 | 3 | 3 | 19 | 389 | 7192 | 81 | 745 | 212 | 216 | 8448 |
| ANR | 1 | 3 | FY77 | 20 | 369 | 7797 | 132 | 79 | 41 | 273 | 8322 |
| ANR | 1 | 3 | FY78 | 20 | 398 | 6116 | 87 | 123 | 251 | 203 | 6782 |
| ANR | 1 | 3 | FY79 | 19 | 400 | 7664 | 25 | 2033 | 344 | 174 | 10242 |
| ANR | 1 | 4 | 3 | 18 | 370 | 6687 | 146 | 5683 | 70 | 255 | 12844 |
| ANR | 1 | 4 | FY77 | 18 | 371 | 5918 | 33 | 16390 | 6 | 374 | 22723 |
| ANR | 1 | 4 | FY78 | 18 | 368 | 7331 | 232 | 32 | 125 | 142 | 7864 |
| ANR | 1 | 4 | FY79 | 19 | 372 | 6814 | 175 | 627 | 80 | 250 | 7947 |

*** VAMNSC-SHIPS OLS DATA ***
SHIP TYPE, CLASS AND HULL AVPRAGES PLUS INDIVIDUAL SHIP OLS COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | HULL | YFARS | OFF | ENL | 1. DIRECT COSTS | 2. INTER MAINT | 3. DEPOT MAINT | 4. REC INVERT | 5. INDIR COSTS | TOTAL OLS |
|------|-------|------|-------|------|------|-----------------|----------------|----------------|---------------|----------------|-----------|
| ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ----- |
| ANR | 1 | 5 | 3 | 20 | 391 | 6329 | 105 | 1588 | 265 | 270 | 8560 |
| ANR | 1 | 5 | FY77 | 20 | 378 | 6963 | 155 | 133 | 6 | 303 | 7562 |
| ANR | 1 | 5 | FY78 | 20 | 394 | 5302 | 51 | 83 | 411 | 201 | 6050 |
| ANR | 1 | 5 | FY79 | 21 | 402 | 6724 | 109 | 4548 | 379 | 308 | 12070 |
| ANR | 1 | 6 | 3 | 19 | 399 | 6964 | 172 | 4544 | 320 | 236 | 12239 |
| ANR | 1 | 6 | FY77 | 18 | 383 | 8477 | 141 | 1060 | 23 | 361 | 10063 |
| ANR | 1 | 6 | FY78 | 20 | 411 | 7074 | 208 | 329 | 169 | 169 | 7951 |
| ANR | 1 | 6 | FY79 | 20 | 404 | 5342 | 167 | 12245 | 768 | 178 | 18703 |
| ANR | 1 | 7 | 2 | 18 | 390 | 6626 | 62 | 322 | 178 | 265 | 7456 |
| ANR | 1 | 7 | FY77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ANR | 1 | 7 | FY78 | 20 | 389 | 6985 | 46 | 76 | 251 | 172 | 7532 |
| ANR | 1 | 7 | FY79 | 17 | 392 | 6268 | 78 | 569 | 106 | 358 | 7381 |
| PF | **** | **** | 174 | 17 | 238 | 4598 | 122 | 4053 | 440 | 163 | 9380 |
| PF | 1037 | **** | 6 | 13 | 193 | 3736 | 121 | 1659 | 557 | 132 | 6208 |
| PF | 1037 | 1037 | 3 | 13 | 199 | 3705 | 108 | 2209 | 1019 | 136 | 7181 |
| PF | 1037 | 1037 | FY77 | 13 | 195 | 3630 | 65 | 6258 | 47 | 165 | 10167 |
| PF | 1037 | 1037 | FY78 | 14 | 196 | 3836 | 94 | 204 | 406 | 112 | 4655 |
| PF | 1037 | 1037 | FY79 | 13 | 207 | 3650 | 165 | 167 | 2605 | 133 | 6723 |
| PF | 1037 | 1038 | 3 | 13 | 188 | 3767 | 134 | 1108 | 94 | 128 | 5235 |
| PF | 1037 | 1038 | FY77 | 14 | 185 | 4076 | 171 | 37 | 180 | 146 | 4612 |
| PF | 1037 | 1038 | FY78 | 14 | 197 | 3819 | 112 | 67 | 58 | 110 | 4167 |
| PF | 1037 | 1038 | FY79 | 13 | 182 | 3407 | 120 | 3222 | 46 | 129 | 6926 |
| PF | 1040 | **** | 30 | 18 | 240 | 4467 | 124 | 3804 | 207 | 162 | 8768 |
| PF | 1040 | 1040 | 3 | 17 | 240 | 4156 | 101 | 887 | 182 | 188 | 5517 |
| PF | 1040 | 1040 | FY77 | 18 | 230 | 4579 | 116 | 199 | 89 | 193 | 5179 |
| PF | 1040 | 1040 | FY78 | 18 | 240 | 3089 | 68 | 201 | 459 | 165 | 3983 |
| PF | 1040 | 1040 | FY79 | 17 | 251 | 4801 | 120 | 2262 | 0 | 207 | 7391 |
| PF | 1040 | 1041 | 3 | 17 | 239 | 5227 | 116 | 5700 | 42 | 148 | 11236 |
| PF | 1040 | 1041 | FY77 | 17 | 235 | 5776 | 47 | 87 | 0 | 199 | 6111 |
| PF | 1040 | 1041 | FY78 | 19 | 237 | 4881 | 217 | 705 | 59 | 113 | 5777 |
| PF | 1040 | 1041 | FY79 | 16 | 245 | 5226 | 84 | 16309 | 68 | 134 | 21822 |

*** VANOS-SEIPS OLS DATA ***
SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP OLS COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| SHIP- TYPE | CLASS | HULL | YFARS | OFF | ENL | 1. DIRECT COSTS | 2. INTER MAINT | 3. DEFPT MAINT | 4. REC INVEST | 5. INDIR COSTS | TOTAL OLS |
|---------------|-------|------|-------|------|------|--------------------|-------------------|-------------------|------------------|-------------------|--------------|
| ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ----- |
| FF | 1040 | 1043 | 3 | 17 | 238 | 4457 | 98 | 15 | 119 | 161 | 4854 |
| FF | 1040 | 1043 | FY77 | 17 | 215 | 4347 | 85 | 19 | 76 | 193 | 4722 |
| FF | 1040 | 1043 | FY78 | 18 | 251 | 3948 | 33 | 1 | 233 | 144 | 4261 |
| FF | 1040 | 1043 | FY79 | 18 | 249 | 5177 | 177 | 25 | 50 | 148 | 5579 |
| FF | 1040 | 1044 | 3 | 17 | 229 | 4053 | 74 | 198 | 79 | 143 | 4552 |
| FF | 1040 | 1044 | FY77 | 18 | 221 | 3774 | 56 | 10 | 6 | 184 | 4031 |
| FF | 1040 | 1044 | FY78 | 17 | 237 | 3661 | 44 | 102 | 46 | 112 | 3968 |
| FF | 1040 | 1044 | FY79 | 18 | 229 | 4726 | 123 | 483 | 187 | 134 | 5657 |
| FF | 1040 | 1045 | 3 | 18 | 244 | 4367 | 214 | 7299 | 67 | 149 | 12099 |
| FF | 1040 | 1045 | FY77 | 19 | 238 | 4289 | 170 | 20460 | 8 | 185 | 25115 |
| FF | 1040 | 1045 | FY78 | 19 | 243 | 4202 | 140 | 1388 | 136 | 149 | 6017 |
| FF | 1040 | 1045 | FY79 | 18 | 251 | 4610 | 334 | 49 | 58 | 115 | 5167 |
| FF | 1040 | 1047 | 3 | 18 | 235 | 4321 | 103 | 4730 | 289 | 148 | 9594 |
| FF | 1040 | 1047 | FY77 | 19 | 236 | 4986 | 116 | 565 | 114 | 194 | 5977 |
| FF | 1040 | 1047 | FY78 | 18 | 235 | 4701 | 150 | 3 | 71 | 95 | 5023 |
| FF | 1040 | 1047 | FY79 | 18 | 236 | 3276 | 43 | 13622 | 683 | 155 | 17782 |
| FF | 1040 | 1048 | 3 | 19 | 262 | 4617 | 126 | 4323 | 381 | 166 | 9616 |
| FF | 1040 | 1048 | FY77 | 18 | 259 | 4717 | 110 | 3869 | 16 | 216 | 8930 |
| FF | 1040 | 1048 | FY78 | 20 | 268 | 5034 | 119 | 9015 | 138 | 132 | 14441 |
| FF | 1040 | 1048 | FY79 | 19 | 261 | 4101 | 151 | 85 | 990 | 150 | 5479 |
| FF | 1040 | 1049 | 3 | 19 | 236 | 4499 | 137 | 3586 | 419 | 169 | 8812 |
| FF | 1040 | 1049 | FY77 | 19 | 217 | 5647 | 278 | 473 | 215 | 191 | 6804 |
| FF | 1040 | 1049 | FY78 | 21 | 239 | 4342 | 120 | 38 | 89 | 129 | 4720 |
| FF | 1040 | 1049 | FY79 | 19 | 232 | 3508 | 13 | 10248 | 955 | 187 | 14912 |
| FF | 1040 | 1050 | 3 | 18 | 249 | 4708 | 119 | 5494 | 21 | 199 | 10543 |
| FF | 1040 | 1050 | FY77 | 19 | 244 | 4698 | 44 | 16258 | 0 | 207 | 21209 |
| FF | 1040 | 1050 | FY78 | 19 | 251 | 4820 | 140 | 9 | 28 | 181 | 5180 |
| FF | 1040 | 1050 | FY79 | 17 | 254 | 4606 | 173 | 216 | 35 | 211 | 5242 |
| FF | 1040 | 1051 | 3 | 17 | 228 | 4249 | 153 | 5809 | 471 | 151 | 10856 |
| FF | 1040 | 1051 | FY77 | 17 | 219 | 4065 | 28 | 16969 | 16 | 185 | 21265 |
| FF | 1040 | 1051 | FY78 | 18 | 227 | 4731 | 158 | 0 | 1289 | 118 | 6297 |
| FF | 1040 | 1051 | FY79 | 18 | 238 | 4011 | 275 | 459 | 110 | 150 | 5007 |

*** VARIOUS-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| SHIP- TYPE | CLASS | HULL | YFARS | OFF | ENL | 1. DIRECT COSTS | 2. INTER MAINT | 3. DEFINT MAINT | 4. REC INVEST | 5. INDIR COSTS | TOTAL O&S |
|---------------|-------|------|-------|-----|-----|--------------------|-------------------|--------------------|------------------|-------------------|--------------|
| FF | 1052 | *** | 138 | 16 | 239 | 4664 | 121 | 4211 | 486 | 164 | 9651 |
| FF | 1052 | 1052 | 3 | 17 | 229 | 4971 | 98 | 7831 | 3028 | 143 | 16075 |
| FF | 1052 | 1052 | FY77 | 17 | 214 | 4812 | 49 | 22079 | 51 | 176 | 27170 |
| FF | 1052 | 1052 | FY78 | 18 | 235 | 4872 | 116 | 497 | 8917 | 112 | 14517 |
| FF | 1052 | 1052 | FY79 | 17 | 238 | 5231 | 130 | 917 | 117 | 142 | 6539 |
| FF | 1052 | 1053 | 3 | 17 | 245 | 5288 | 198 | 887 | 106 | 155 | 6637 |
| FF | 1052 | 1053 | FY77 | 17 | 241 | 5888 | 138 | 241 | 53 | 196 | 6517 |
| FF | 1052 | 1053 | FY78 | 17 | 251 | 5062 | 210 | 0 | 125 | 131 | 5530 |
| FF | 1052 | 1053 | FY79 | 17 | 243 | 4916 | 247 | 2421 | 141 | 138 | 7865 |
| FF | 1052 | 1054 | 3 | 16 | 244 | 4605 | 106 | 10936 | 334 | 167 | 16151 |
| FF | 1052 | 1054 | FY77 | 17 | 239 | 4831 | 194 | 3765 | 48 | 205 | 9045 |
| FF | 1052 | 1054 | FY78 | 17 | 241 | 5387 | 95 | 0 | 76 | 100 | 5660 |
| FF | 1052 | 1054 | FY79 | 15 | 254 | 3598 | 29 | 29043 | 880 | 198 | 33750 |
| FF | 1052 | 1055 | 3 | 16 | 247 | 3983 | 169 | 1444 | 527 | 168 | 6293 |
| FF | 1052 | 1055 | FY77 | 16 | 247 | 4449 | 142 | 212 | 46 | 205 | 5056 |
| FF | 1052 | 1055 | FY78 | 17 | 249 | 3130 | 64 | 0 | 32 | 154 | 3381 |
| FF | 1052 | 1055 | FY79 | 16 | 246 | 4370 | 302 | 4121 | 1503 | 145 | 10444 |
| FF | 1052 | 1056 | 3 | 18 | 242 | 4689 | 148 | 4166 | 567 | 196 | 9769 |
| FF | 1052 | 1056 | FY77 | 18 | 243 | 5624 | 101 | 0 | 197 | 212 | 6135 |
| FF | 1052 | 1056 | FY78 | 18 | 248 | 4615 | 281 | 35 | 101 | 193 | 5228 |
| FF | 1052 | 1056 | FY79 | 18 | 236 | 3830 | 62 | 12465 | 1404 | 184 | 17946 |
| FF | 1052 | 1057 | 3 | 17 | 250 | 4908 | 92 | 6341 | 89 | 144 | 11577 |
| FF | 1052 | 1057 | FY77 | 17 | 245 | 5638 | 52 | 193 | 43 | 192 | 6120 |
| FF | 1052 | 1057 | FY78 | 18 | 252 | 3722 | 100 | 18651 | 119 | 134 | 22728 |
| FF | 1052 | 1057 | FY79 | 16 | 253 | 5366 | 126 | 181 | 105 | 106 | 5885 |
| FF | 1052 | 1058 | 3 | 16 | 243 | 4362 | 77 | 2279 | 487 | 162 | 7370 |
| FF | 1052 | 1058 | FY77 | 16 | 236 | 5570 | 94 | 37 | 1 | 176 | 5880 |
| FF | 1052 | 1058 | FY78 | 17 | 250 | 3757 | 77 | 15 | 1 | 159 | 4011 |
| FF | 1052 | 1058 | FY79 | 17 | 244 | 3761 | 61 | 6786 | 1459 | 152 | 12220 |

*** VANOS-SHIP'S OCS DATA ***
 SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP OCS COSTS
 FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | HULL | YFAS | OFF | ENL | 1. DIRECT COSTS | 2. INTER MAINT | 3. DEPOT MAINT | 4. REC INVEST | 5. INDIR COSTS | TOTAL OCS |
|------|-------|------|------|------|------|-----------------|----------------|----------------|---------------|----------------|-----------|
| ---- | ---- | ---- | ---- | ---- | ---- | ----- | ----- | ----- | ----- | ----- | ----- |
| FF | 1052 | 1059 | 3 | 16 | 229 | 5010 | 126 | 6167 | 129 | 167 | 11602 |
| FF | 1052 | 1059 | FY77 | 15 | 218 | 5319 | 167 | 717 | 176 | 199 | 6581 |
| FF | 1052 | 1059 | FY78 | 17 | 231 | 5335 | 159 | 2 | 154 | 152 | 5803 |
| FF | 1052 | 1059 | FY79 | 17 | 239 | 4378 | 52 | 17782 | 59 | 150 | 22422 |
| FF | 1052 | 1060 | 3 | 16 | 247 | 4391 | 117 | 106 | 418 | 160 | 5196 |
| FF | 1052 | 1060 | FY77 | 17 | 247 | 4810 | 144 | 91 | 46 | 189 | 5281 |
| FF | 1052 | 1060 | FY78 | 17 | 242 | 3480 | 10 | 0 | 1080 | 144 | 4717 |
| FF | 1052 | 1060 | FY79 | 16 | 252 | 4884 | 198 | 227 | 130 | 149 | 5590 |
| FF | 1052 | 1061 | 3 | 16 | 233 | 4375 | 157 | 8949 | 317 | 148 | 13948 |
| FF | 1052 | 1061 | FY77 | 16 | 224 | 3676 | 28 | 24277 | 28 | 212 | 28223 |
| FF | 1052 | 1061 | FY78 | 17 | 229 | 5039 | 195 | 658 | 161 | 111 | 6165 |
| FF | 1052 | 1061 | FY79 | 17 | 246 | 4411 | 250 | 1912 | 762 | 122 | 7458 |
| FF | 1052 | 1062 | 3 | 18 | 252 | 5138 | 129 | 1759 | 66 | 152 | 7247 |
| FF | 1052 | 1062 | FY77 | 18 | 249 | 5776 | 71 | 2314 | 53 | 192 | 8408 |
| FF | 1052 | 1062 | FY78 | 18 | 254 | 5344 | 150 | 1520 | 111 | 136 | 7263 |
| FF | 1052 | 1062 | FY79 | 18 | 255 | 4294 | 168 | 1444 | 35 | 129 | 6072 |
| FF | 1052 | 1063 | 3 | 16 | 242 | 4604 | 198 | 5482 | 91 | 168 | 10546 |
| FF | 1052 | 1063 | FY77 | 16 | 243 | 4919 | 74 | 15100 | 14 | 185 | 20294 |
| FF | 1052 | 1063 | FY78 | 17 | 242 | 4862 | 204 | 5 | 161 | 124 | 5358 |
| FF | 1052 | 1063 | FY79 | 17 | 243 | 4031 | 318 | 1341 | 100 | 195 | 5987 |
| FF | 1052 | 1064 | 3 | 17 | 240 | 4979 | 76 | 88 | 119 | 162 | 5428 |
| FF | 1052 | 1064 | FY77 | 17 | 249 | 5417 | 39 | 0 | 44 | 215 | 5717 |
| FF | 1052 | 1064 | FY78 | 17 | 244 | 4838 | 131 | 4 | 152 | 118 | 5245 |
| FF | 1052 | 1064 | FY79 | 17 | 229 | 4683 | 60 | 261 | 163 | 155 | 5323 |
| FF | 1052 | 1065 | 3 | 17 | 238 | 4740 | 149 | 3847 | 641 | 138 | 9519 |
| FF | 1052 | 1065 | FY77 | 18 | 230 | 4884 | 143 | 10603 | 56 | 170 | 15858 |
| FF | 1052 | 1065 | FY78 | 19 | 242 | 4674 | 124 | 10 | 266 | 108 | 5185 |
| FF | 1052 | 1065 | FY79 | 16 | 244 | 4642 | 182 | 929 | 1603 | 137 | 7514 |
| FF | 1052 | 1066 | 3 | 17 | 243 | 4284 | 112 | 5464 | 726 | 186 | 10776 |
| FF | 1052 | 1066 | FY77 | 18 | 249 | 5186 | 215 | 1106 | 83 | 224 | 6816 |
| FF | 1052 | 1066 | FY78 | 18 | 247 | 3970 | 101 | 3 | 337 | 130 | 4543 |
| FF | 1052 | 1066 | FY79 | 16 | 234 | 3697 | 20 | 15284 | 1760 | 205 | 20969 |

*** VAMOSC-SHIPS OLS DATA ***
 SHIP TYPE, CLASS AND MULT, AVERAGES PLUS INDIVIDUAL SHIP OLS COSTS
 FOR FY77-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | MULT | SHIP- YFAPS | OFF | ENL | 1. DIRECT COSTS | 2. INTER MAINT | 3. DEPT MAINT | 4. REC INVEST | 5. INDTR COSTS | TOTAL OLS |
|------|-------|------|----------------|-----|-----|--------------------|-------------------|------------------|------------------|-------------------|--------------|
| FF | 1052 | 1067 | 3 | 15 | 247 | 5137 | 91 | 438 | 547 | 146 | 6362 |
| FF | 1052 | 1067 | FY77 | 15 | 248 | 5554 | 75 | 0 | 73 | 197 | 5901 |
| FF | 1052 | 1067 | FY78 | 17 | 254 | 6121 | 57 | 0 | 93 | 122 | 6394 |
| FF | 1052 | 1067 | FY79 | 15 | 239 | 3736 | 143 | 1315 | 1477 | 119 | 6792 |
| FF | 1052 | 1068 | 3 | 16 | 239 | 4858 | 203 | 131 | 138 | 159 | 5491 |
| FF | 1052 | 1068 | FY77 | 17 | 235 | 4953 | 129 | 85 | 110 | 188 | 5467 |
| FF | 1052 | 1068 | FY78 | 17 | 235 | 4905 | 247 | 2 | 156 | 163 | 5476 |
| FF | 1052 | 1068 | FY79 | 16 | 248 | 4716 | 233 | 306 | 148 | 128 | 5532 |
| FF | 1052 | 1069 | 3 | 16 | 242 | 4538 | 111 | 7269 | 941 | 146 | 13009 |
| FF | 1052 | 1069 | FY77 | 16 | 233 | 5686 | 196 | 457 | 35 | 183 | 6559 |
| FF | 1052 | 1069 | FY78 | 16 | 246 | 3683 | 75 | 14827 | 49 | 108 | 18743 |
| FF | 1052 | 1069 | FY79 | 17 | 248 | 4246 | 64 | 6524 | 2741 | 149 | 13726 |
| FF | 1052 | 1070 | 3 | 16 | 249 | 4556 | 115 | 603 | 752 | 169 | 6199 |
| FF | 1052 | 1070 | FY77 | 16 | 240 | 3956 | 57 | 0 | 8 | 192 | 4215 |
| FF | 1052 | 1070 | FY78 | 17 | 260 | 4234 | 125 | 1023 | 1296 | 142 | 6822 |
| FF | 1052 | 1070 | FY79 | 16 | 247 | 5479 | 165 | 788 | 952 | 175 | 7561 |
| FF | 1052 | 1071 | 3 | 16 | 251 | 5261 | 127 | 7078 | 160 | 154 | 12783 |
| FF | 1052 | 1071 | FY77 | 17 | 235 | 5080 | 20 | 20641 | 132 | 217 | 26092 |
| FF | 1052 | 1071 | FY78 | 17 | 259 | 5420 | 166 | 193 | 154 | 116 | 6050 |
| FF | 1052 | 1071 | FY79 | 15 | 259 | 5283 | 197 | 402 | 194 | 130 | 6207 |
| FF | 1052 | 1072 | 3 | 18 | 229 | 4846 | 113 | 894 | 143 | 170 | 6169 |
| FF | 1052 | 1072 | FY77 | 18 | 230 | 5319 | 103 | 56 | 244 | 187 | 5911 |
| FF | 1052 | 1072 | FY78 | 18 | 235 | 5181 | 173 | 74 | 134 | 171 | 5734 |
| FF | 1052 | 1072 | FY79 | 18 | 223 | 4040 | 65 | 2552 | 52 | 152 | 6863 |
| FF | 1052 | 1073 | 3 | 17 | 254 | 4742 | 112 | 2179 | 222 | 141 | 7400 |
| FF | 1052 | 1073 | FY77 | 18 | 242 | 4769 | 83 | 0 | 37 | 202 | 5092 |
| FF | 1052 | 1073 | FY78 | 18 | 257 | 4510 | 126 | 6328 | 497 | 110 | 11573 |
| FF | 1052 | 1073 | FY79 | 16 | 263 | 4947 | 128 | 211 | 134 | 112 | 5535 |
| FF | 1052 | 1074 | 3 | 16 | 247 | 4443 | 157 | 8585 | 408 | 163 | 13740 |
| FF | 1052 | 1074 | FY77 | 17 | 236 | 3931 | 38 | 23975 | 5 | 203 | 28155 |
| FF | 1052 | 1074 | FY78 | 16 | 251 | 4968 | 158 | 1577 | 445 | 138 | 7288 |
| FF | 1052 | 1074 | FY79 | 16 | 255 | 4431 | 277 | 144 | 775 | 149 | 5778 |

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | HULL | YEARS | SHIP- OFF | ENL | 1. DIRECT COSTS | 2. INTER MAINT | 3. DEPOT MAINT | 4. REC INVEST | 5. INDIR COSTS | TOTAL O&S |
|------|-------|------|-------|--------------|-----|--------------------|-------------------|-------------------|------------------|-------------------|--------------|
| FF | 1052 | 1075 | 3 | 18 | 235 | 5341 | 107 | 200 | 213 | 164 | 6029 |
| FF | 1052 | 1075 | 18 | 228 | | 5140 | 73 | 67 | 274 | 193 | 5749 |
| FF | 1052 | 1075 | 18 | 237 | | 5405 | 134 | 68 | 215 | 142 | 5965 |
| FF | 1052 | 1075 | 18 | 240 | | 5480 | 116 | 466 | 151 | 159 | 6373 |
| FF | 1052 | 1076 | 3 | 17 | 243 | 4056 | 105 | 1138 | 515 | 162 | 5979 |
| FF | 1052 | 1076 | 16 | 229 | | 4065 | 53 | 3 | 26 | 198 | 4348 |
| FF | 1052 | 1076 | 19 | 244 | | 3319 | 79 | 1929 | 1356 | 138 | 6822 |
| FF | 1052 | 1076 | 17 | 258 | | 4786 | 184 | 1483 | 163 | 152 | 6769 |
| FF | 1052 | 1077 | 3 | 17 | 247 | 4718 | 174 | 13793 | 529 | 150 | 19367 |
| FF | 1052 | 1077 | 18 | 237 | | 5260 | 169 | 40518 | 24 | 191 | 46163 |
| FF | 1052 | 1077 | 18 | 249 | | 5118 | 81 | 0 | 134 | 101 | 5435 |
| FF | 1052 | 1077 | 16 | 257 | | 3778 | 273 | 863 | 1431 | 159 | 6505 |
| FF | 1052 | 1078 | 3 | 17 | 247 | 4902 | 107 | 6497 | 173 | 191 | 11874 |
| FF | 1052 | 1078 | 17 | 248 | | 4544 | 33 | 18541 | 146 | 193 | 23459 |
| FF | 1052 | 1078 | 17 | 252 | | 4248 | 217 | 423 | 159 | 185 | 5234 |
| FF | 1052 | 1078 | 18 | 242 | | 5916 | 72 | 528 | 215 | 197 | 6929 |
| FF | 1052 | 1079 | 3 | 16 | 232 | 5330 | 132 | 6742 | 199 | 161 | 12568 |
| FF | 1052 | 1079 | 16 | 230 | | 5204 | 53 | 19283 | 184 | 191 | 24918 |
| FF | 1052 | 1079 | 17 | 229 | | 5300 | 150 | 16 | 220 | 128 | 5816 |
| FF | 1052 | 1079 | 16 | 239 | | 5497 | 193 | 929 | 195 | 166 | 6971 |
| FF | 1052 | 1080 | 3 | 16 | 237 | 4746 | 123 | 961 | 1472 | 169 | 7475 |
| FF | 1052 | 1080 | 16 | 228 | | 4174 | 49 | 0 | 98 | 174 | 4497 |
| FF | 1052 | 1080 | 17 | 238 | | 5333 | 154 | 758 | 457 | 174 | 6879 |
| FF | 1052 | 1080 | 17 | 245 | | 4733 | 168 | 2125 | 3861 | 161 | 11051 |
| FF | 1052 | 1081 | 3 | 16 | 238 | 4581 | 147 | 6855 | 179 | 180 | 11944 |
| FF | 1052 | 1081 | 16 | 231 | | 4157 | 5 | 19465 | 142 | 196 | 23966 |
| FF | 1052 | 1081 | 16 | 235 | | 4930 | 195 | 79 | 175 | 169 | 5550 |
| FF | 1052 | 1081 | 16 | 250 | | 4656 | 242 | 1021 | 221 | 175 | 6317 |
| FF | 1052 | 1082 | 3 | 16 | 232 | 4628 | 115 | 72 | 185 | 181 | 5184 |
| FF | 1052 | 1082 | 16 | 224 | | 4785 | 105 | 0 | 112 | 174 | 5177 |
| FF | 1052 | 1082 | 17 | 236 | | 4043 | 67 | 208 | 337 | 180 | 4837 |
| FF | 1052 | 1082 | 17 | 236 | | 5057 | 175 | 8 | 108 | 190 | 5540 |

*** VANOS-CHIPS OES DATA ***
 SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP OES COSTS
 FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | HULL | YFARS | OFF | ENL | 1. DIRECT COSTS | 2. INTER MAINT | 3. DEPOT MAINT | 4. REC INVEST | 5. INDIR COSTS | TOTAL OES |
|------|-------|------|-------|------|------|-----------------|----------------|----------------|---------------|----------------|-----------|
| ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ----- |
| FF | 1052 | 1083 | 3 | 17 | 247 | 4192 | 120 | 2259 | 750 | 176 | 7501 |
| FF | 1052 | 1083 | FY77 | 16 | 239 | 5124 | 203 | 42 | 98 | 201 | 5670 |
| FF | 1052 | 1083 | FY78 | 18 | 250 | 3340 | 104 | 0 | 25 | 129 | 3599 |
| FF | 1052 | 1083 | FY79 | 17 | 252 | 4113 | 53 | 6737 | 2128 | 200 | 13234 |
| FF | 1052 | 1084 | 3 | 16 | 230 | 4438 | 107 | 7175 | 140 | 177 | 12041 |
| FF | 1052 | 1084 | FY77 | 16 | 226 | 5115 | 164 | 17 | 69 | 171 | 5538 |
| FF | 1052 | 1084 | FY78 | 17 | 233 | 3450 | 41 | 20601 | 275 | 186 | 24556 |
| FF | 1052 | 1084 | FY79 | 17 | 233 | 4750 | 117 | 909 | 76 | 176 | 6030 |
| FF | 1052 | 1085 | 3 | 18 | 233 | 4353 | 139 | 890 | 143 | 185 | 5714 |
| FF | 1052 | 1085 | FY77 | 17 | 224 | 4476 | 180 | 0 | 46 | 188 | 4892 |
| FF | 1052 | 1085 | FY78 | 18 | 240 | 3727 | 32 | 17 | 299 | 166 | 4243 |
| FF | 1052 | 1085 | FY79 | 19 | 236 | 4857 | 206 | 2655 | 86 | 202 | 8009 |
| FF | 1052 | 1086 | 3 | 17 | 245 | 5006 | 154 | 6420 | 166 | 160 | 11909 |
| FF | 1052 | 1086 | FY77 | 17 | 237 | 5598 | 69 | 42 | 44 | 194 | 5949 |
| FF | 1052 | 1086 | FY78 | 18 | 248 | 3918 | 86 | 19049 | 311 | 179 | 23544 |
| FF | 1052 | 1086 | FY79 | 17 | 250 | 5504 | 308 | 171 | 143 | 107 | 6235 |
| FF | 1052 | 1087 | 3 | 17 | 224 | 4073 | 71 | 429 | 626 | 155 | 5358 |
| FF | 1052 | 1087 | FY77 | 17 | 222 | 4221 | 64 | 2 | 49 | 203 | 4542 |
| FF | 1052 | 1087 | FY78 | 18 | 225 | 3263 | 111 | 0 | 1698 | 108 | 5181 |
| FF | 1052 | 1087 | FY79 | 17 | 227 | 4735 | 39 | 1287 | 133 | 154 | 6351 |
| FF | 1052 | 1088 | 3 | 17 | 243 | 4380 | 98 | 6926 | 727 | 166 | 12299 |
| FF | 1052 | 1088 | FY77 | 16 | 231 | 5521 | 147 | 6 | 10 | 180 | 5866 |
| FF | 1052 | 1088 | FY78 | 18 | 251 | 3395 | 44 | 16677 | 28 | 159 | 20305 |
| FF | 1052 | 1088 | FY79 | 18 | 248 | 4274 | 103 | 4095 | 2143 | 161 | 10727 |
| FF | 1052 | 1089 | 3 | 17 | 229 | 4366 | 45 | 1347 | 738 | 137 | 6637 |
| FF | 1052 | 1089 | FY77 | 17 | 225 | 5369 | 58 | 66 | 99 | 164 | 5758 |
| FF | 1052 | 1089 | FY78 | 18 | 228 | 3040 | 7 | 13 | 9 | 107 | 3178 |
| FF | 1052 | 1089 | FY79 | 17 | 235 | 4691 | 72 | 3964 | 2107 | 140 | 10976 |
| FF | 1052 | 1090 | 3 | 16 | 231 | 4542 | 132 | 7236 | 649 | 170 | 12732 |
| FF | 1052 | 1090 | FY77 | 17 | 226 | 5494 | 98 | 0 | 265 | 179 | 6038 |
| FF | 1052 | 1090 | FY78 | 16 | 233 | 4111 | 262 | 12236 | 106 | 149 | 16866 |
| FF | 1052 | 1090 | FY79 | 16 | 234 | 4021 | 38 | 9473 | 1576 | 182 | 15292 |

*** VANOSC-SHIPS O&S DATA ***
SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS
FOR FY77-FY78-FY79 BY FIRST LEVFL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | HULL | SHIP- # | YFAPS | OFF | ENL | 1.DIRECT COSTS | 2.INTER MAINT | 3.DEPOT MAINT | 4.REC INVEST | 5.INDIR COSTS | TOTAL O&S |
|------|-------|------|------------|-------|-----|-----|-------------------|------------------|------------------|-----------------|------------------|--------------|
| FF | 1052 | 1091 | 3 | 17 | 239 | | 4674 | 106 | 5089 | 724 | 182 | 10779 |
| FF | 1052 | 1091 | FY77 | 18 | 238 | | 5781 | 88 | 223 | 130 | 187 | 6411 |
| FF | 1052 | 1091 | FY78 | 18 | 245 | | 4329 | 162 | 11 | 65 | 184 | 4754 |
| FF | 1052 | 1091 | FY79 | 17 | 235 | | 3914 | 69 | 15034 | 1977 | 176 | 21172 |
| FF | 1052 | 1092 | 3 | 16 | 235 | | 4387 | 105 | 7628 | 528 | 182 | 12834 |
| FF | 1052 | 1092 | FY77 | 18 | 231 | | 5038 | 128 | 158 | 75 | 187 | 5588 |
| FF | 1052 | 1092 | FY78 | 16 | 237 | | 4725 | 171 | 501 | 132 | 131 | 5663 |
| FF | 1052 | 1092 | FY79 | 15 | 237 | | 3400 | 18 | 22227 | 1377 | 229 | 27253 |
| FF | 1052 | 1093 | 3 | 15 | 228 | | 4430 | 126 | 1712 | 773 | 152 | 7196 |
| FF | 1052 | 1093 | FY77 | 16 | 225 | | 5279 | 220 | 80 | 137 | 184 | 5902 |
| FF | 1052 | 1093 | FY78 | 16 | 233 | | 3745 | 39 | 0 | 37 | 125 | 3947 |
| FF | 1052 | 1093 | FY79 | 14 | 226 | | 4268 | 119 | 5058 | 2145 | 149 | 11741 |
| FF | 1052 | 1094 | 3 | 18 | 227 | | 4485 | 83 | 4793 | 600 | 183 | 10147 |
| FF | 1052 | 1094 | FY77 | 19 | 224 | | 5179 | 143 | 0 | 178 | 180 | 5681 |
| FF | 1052 | 1094 | FY78 | 18 | 228 | | 4914 | 65 | 15 | 232 | 129 | 5357 |
| FF | 1052 | 1094 | FY79 | 18 | 231 | | 3362 | 43 | 14364 | 1392 | 241 | 19403 |
| FF | 1052 | 1095 | 3 | 16 | 239 | | 4694 | 105 | 6690 | 623 | 179 | 12294 |
| FF | 1052 | 1095 | FY77 | 17 | 224 | | 5230 | 124 | 44 | 99 | 194 | 5694 |
| FF | 1052 | 1095 | FY78 | 16 | 244 | | 5579 | 153 | 1147 | 83 | 131 | 7095 |
| FF | 1052 | 1095 | FY79 | 16 | 250 | | 3273 | 39 | 18879 | 1689 | 213 | 24095 |
| FF | 1052 | 1096 | 3 | 16 | 234 | | 4633 | 69 | 5054 | 601 | 176 | 10536 |
| FF | 1052 | 1096 | FY77 | 17 | 234 | | 5229 | 78 | 28 | 111 | 198 | 5645 |
| FF | 1052 | 1096 | FY78 | 16 | 229 | | 5238 | 105 | 29 | 107 | 140 | 5621 |
| FF | 1052 | 1096 | FY79 | 17 | 241 | | 3434 | 26 | 15106 | 1585 | 191 | 20344 |
| FF | 1052 | 1097 | 3 | 16 | 224 | | 4901 | 138 | 921 | 147 | 170 | 6281 |
| FF | 1052 | 1097 | FY77 | 16 | 221 | | 5170 | 165 | 362 | 191 | 185 | 6075 |
| FF | 1052 | 1097 | FY78 | 16 | 225 | | 4857 | 135 | 70 | 128 | 149 | 5341 |
| FF | 1052 | 1097 | FY79 | 16 | 227 | | 4677 | 116 | 2333 | 123 | 178 | 7429 |
| FFG | *** | *** | 18 | 16 | 243 | | 5304 | 128 | 2065 | 237 | 174 | 7912 |
| FFG | 1 | *** | 18 | 16 | 243 | | 5304 | 128 | 2065 | 237 | 174 | 7912 |
| FFG | 1 | 1 | 3 | 17 | 243 | | 5390 | 145 | 927 | 146 | 154 | 6766 |
| FFG | 1 | 1 | FY77 | 17 | 242 | | 5893 | 126 | 847 | 61 | 202 | 7131 |
| FFG | 1 | 1 | FY78 | 17 | 243 | | 4998 | 159 | 1673 | 187 | 131 | 7150 |
| FFG | 1 | 1 | FY79 | 17 | 244 | | 5280 | 152 | 262 | 191 | 129 | 6017 |

*** VAMNSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVFRAGES PLUS INDIVIDUAL SHIP O&S COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | HULL | SHIP- YEARS | OFF | ENL | 1.DIRECT COSTS | 2.INTER MAINT | 3.DEPOT MAINT | 4.REC INVEST | 5.INDIR COSTS | TOTAL O&S |
|------|-------|------|----------------|-----|-----|-------------------|------------------|------------------|-----------------|------------------|--------------|
| FFG | 1 | 2 | 3 | 16 | 247 | 4885 | 54 | 2955 | 617 | 170 | 8684 |
| FFG | 1 | 2 | FY77 | 17 | 244 | 5293 | 42 | 2 | 69 | 192 | 5599 |
| FFG | 1 | 2 | FY78 | 18 | 257 | 3863 | 37 | 8815 | 193 | 181 | 13092 |
| FFG | 1 | 2 | FY79 | 15 | 241 | 5500 | 84 | 50 | 1590 | 137 | 7363 |
| FFG | 1 | 3 | 3 | 15 | 242 | 5191 | 145 | 6170 | 155 | 171 | 11835 |
| FFG | 1 | 3 | FY77 | 16 | 232 | 5020 | 83 | 18327 | 21 | 197 | 23650 |
| FFG | 1 | 3 | FY78 | 16 | 238 | 4995 | 169 | 10 | 222 | 132 | 5531 |
| FFG | 1 | 3 | FY79 | 13 | 257 | 5558 | 183 | 175 | 223 | 184 | 6325 |
| FFG | 1 | 4 | 3 | 16 | 245 | 4779 | 133 | 683 | 149 | 182 | 5930 |
| FFG | 1 | 4 | FY77 | 16 | 240 | 5003 | 216 | 0 | 152 | 188 | 5561 |
| FFG | 1 | 4 | FY78 | 17 | 258 | 3839 | 51 | 1615 | 107 | 186 | 5801 |
| FFG | 1 | 4 | FY79 | 15 | 239 | 5495 | 133 | 436 | 189 | 173 | 6429 |
| FFG | 1 | 5 | 3 | 17 | 242 | 5636 | 142 | 1152 | 158 | 177 | 7267 |
| FFG | 1 | 5 | FY77 | 16 | 238 | 5601 | 74 | 0 | 170 | 196 | 6042 |
| FFG | 1 | 5 | FY78 | 19 | 250 | 5244 | 216 | 760 | 162 | 142 | 6526 |
| FFG | 1 | 5 | FY79 | 18 | 238 | 6063 | 137 | 2696 | 144 | 193 | 9234 |
| FFG | 1 | 6 | 3 | 17 | 238 | 5945 | 147 | 502 | 199 | 195 | 6991 |
| FFG | 1 | 6 | FY77 | 18 | 233 | 6531 | 87 | 146 | 157 | 202 | 7125 |
| FFG | 1 | 6 | FY78 | 17 | 243 | 5635 | 132 | 361 | 227 | 198 | 6555 |
| FFG | 1 | 6 | FY79 | 16 | 240 | 5670 | 224 | 1000 | 213 | 185 | 7295 |
| TAU | *** | *** | 6 | 15 | 289 | 5637 | 142 | 4908 | 56 | 163 | 10908 |
| TAO | 72 | *** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 72 | 57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 72 | 57 | FY77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 72 | 57 | FY78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 72 | 57 | FY79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 72 | 62 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 72 | 62 | FY77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 72 | 62 | FY78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 72 | 62 | FY79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*** VANOSC-SHIPS O&S DATA ***
 SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS
 FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | HULL | SHIP- YEARS | SHIP- # | OFF | ENL | 1.DIRECT COSTS | 2.INTER MAINT | 3.DEPOT MAINT | 4.PEC INVEST | 5.INDIR COSTS | TOTAL O&S |
|------|-------|------|----------------|------------|-----|------|-------------------|------------------|------------------|-----------------|------------------|--------------|
| TAO | 105 | *** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 105 | FY77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 105 | FY78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 105 | FY79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 106 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 106 | FY77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 106 | FY78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 106 | FY79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 107 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 107 | FY77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 107 | FY78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 107 | FY79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 108 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 108 | FY77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 108 | FY78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 108 | FY79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 109 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 109 | FY77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 109 | FY78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 105 | 109 | FY79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 143 | *** | 6 | 15 | 289 | 5637 | 142 | 4908 | 56 | 163 | 10908 | |
| TAO | 143 | 143 | 1 | 15 | 291 | 6366 | 288 | 432 | 21 | 228 | 7336 | |
| TAO | 143 | 143 | FY77 | 15 | 291 | 6366 | 288 | 432 | 21 | 228 | 7336 | |
| TAO | 143 | 143 | FY78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| TAO | 143 | 143 | FY79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| TAO | 143 | 144 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| TAO | 143 | 144 | FY77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| TAO | 143 | 144 | FY78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| TAO | 143 | 144 | FY79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL, AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

| TYPE | CLASS | HULL | SHIP- YEARS | # | 1. DIRECT COSTS | 2. INTER MAINT | 3. DEPOT MAINT | 4. REC INVEST | 5. INDTR COSTS | TOTAL O&S |
|------|-------|------|----------------|----|--------------------|-------------------|-------------------|------------------|-------------------|--------------|
| TAO | 143 | 145 | 2 | 15 | 285 | 66 | 5917 | 32 | 165 | 12167 |
| TAO | 143 | 145 | PY77 | 15 | 281 | 92 | 11372 | 37 | 221 | 17533 |
| TAO | 143 | 145 | PY78 | 15 | 289 | 40 | 462 | 27 | 110 | 6802 |
| TAO | 143 | 145 | PY79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAO | 143 | 146 | 3 | 15 | 291 | 144 | 5727 | 84 | 140 | 11260 |
| TAO | 143 | 146 | PY77 | 15 | 288 | 102 | 8872 | 5 | 214 | 15730 |
| TAO | 143 | 146 | PY78 | 15 | 297 | 153 | 4840 | 226 | 112 | 9270 |
| TAO | 143 | 146 | PY79 | 15 | 289 | 177 | 3470 | 23 | 96 | 8782 |

APPENDIX C

This appendix presents fuel delivery cost equations and calculations.

Current Delivery Cost

Oiler Equation: $\left[\begin{array}{c} \text{Average} \\ \text{Annual} \\ \text{Acquisition} \\ \text{Cost} \end{array} \right] + \left[\begin{array}{c} \text{Average} \\ \text{Annual} \\ \text{O\&S} \\ \text{Cost} \end{array} \right] \left[\begin{array}{c} \text{DFM} \\ \% \text{ of} \\ \text{Total} \\ \text{POL} \end{array} \right] \left[\begin{array}{c} \text{Number} \\ \text{of} \\ \text{Oilers} \end{array} \right]$

$$\text{AO: } [(3.355) + (14.637)] [78\%] [5]$$

$$= [17.992] [78\%] [5]$$

$$= \underline{\$70.169\text{M}}$$

$$\text{TAO: } [(2.522) + (20.586)] [72\%] [11]$$

$$= [23.108] [72\%] [11]$$

$$= \underline{\$183.015\text{M}}$$

Escort Equation: $\left[\begin{array}{c} \text{Average} \\ \text{Annual} \\ \text{Acquisition} \\ \text{Cost} \end{array} \right] + \left[\begin{array}{c} \text{Average} \\ \text{Annual} \\ \text{O\&S} \\ \text{Cost} \end{array} \right] \left[\begin{array}{c} \text{Composite} \\ \text{DFM \%} \\ \text{of Total} \\ \text{POL} \end{array} \right] \left[\begin{array}{c} \text{Number} \\ \text{of Escorts} \\ \text{Per Oiler} \end{array} \right] \left[\begin{array}{c} \text{Number} \\ \text{of} \\ \text{Oilers} \end{array} \right]$

$$= [(2.243) + (9.242)] [73\%] [.75] [16]$$

$$= [11.485] [73\%] [.75] [16]$$

$$= \underline{\$100.609\text{M}}$$

$$\text{Total} \quad \$ 70.169 + 183.015 + 100.609$$

$$\text{Delivery cost} \quad \underline{\$353.793\text{M}}$$

Fuel Delivery Quantities

$$\text{Equation: } \left(\begin{array}{c} \text{Average} \\ \text{Annual} \\ \text{Deliveries} \end{array} \right) \quad \left(\begin{array}{c} \text{Number} \\ \text{of} \\ \text{Oilers} \end{array} \right)$$

$$\text{AO: } (275.3\text{K bbls}) \quad (5)$$

$$= \underline{1.376\text{M bbls}}$$

$$\text{TAO: } (767.7 \text{ K bbls}) \quad (11)$$

$$= \underline{8.445\text{M bbls}}$$

$$\text{TOTAL: } 1.376\text{M} + 8.445\text{M}$$

$$= \underline{9.821\text{M bbls}}$$

Current Delivery Cost per Barrel for Escorted UNREP Oiler

$$\text{Equation: } \left(\begin{array}{c} \text{Total} \\ \text{Delivery} \\ \text{Cost} \end{array} \right) \div \left(\begin{array}{c} \text{Total} \\ \text{Delivery} \\ \text{Quantity} \end{array} \right)$$

$$(\$353.793\text{M}) \quad (9.821\text{M bbls})$$

$$= \underline{\$36.02/\text{bbl}}$$

Current Normalized Fuel Delivery Cost

$$\text{Equation: } \left(\begin{array}{c} \text{Current} \\ \text{UNREP} \\ \text{Delivery} \\ \text{Cost} \end{array} \right) \cdot \left(\begin{array}{c} \text{UNREP} \\ \text{Fuel} \\ \text{Delivery} \\ \text{Percent} \end{array} \right)$$

$$(\$36.02/\text{bbl}) \quad (70\%)$$

$$= \underline{\$25.21/\text{bbl}}$$

Future Delivery Cost

$$\text{AO 177 } (5.8 + 14.5) (60\%) (1)$$

$$= (20.3) (60\%) (1)$$

$$= \underline{\$12.18\text{M}}$$

$$\text{FFG 7 } (7.5 + 8.3) (60\%) (.75) (1)$$

$$= (15.8) (60) (.75) (1)$$

$$= \underline{\$7.11\text{M}}$$

Total Future Delivery Cost

$$12.18 + 7.11$$

$$= \$19.29\text{M}$$

Future Delivery Cost per Barrel for Escorted UNREP Oiler

$$(\$19.29\text{M}) \div (.288\text{M bbls})$$

$$= \$66.98/\text{bbl}$$

Future Normalized Fuel Delivery Cost

$$(\$66.98) (.7) = \$46.89/\text{bbl}$$

Total Normalized Delivery Cost

$$\left[\left(\begin{array}{c} \text{Current} \\ \text{Delivery} \\ \text{Cost} \end{array} \right) + \left(\begin{array}{c} \text{Future} \\ \text{Delivery} \\ \text{Cost} \end{array} \right) \right] \div 2$$

$$= (25.21 + 46.89) \div 2 = \$36.05/\text{bbl}$$